

## WHAT IS CLAIMED IS:

1. A method of producing a coated substrate comprising the steps of:
  - a) forming a composite, multilayer free flowing curtain, whereby the multilayer free flowing curtain comprises at least two layers imparting at least two different barrier functionalities selected from the group consisting of oil and/or grease barrier functionality, water vapor barrier functionality, water resistance functionality, and oxygen barrier functionality, and
  - b) contacting the curtain with a continuous web substrate, whereby,
    - in case an oil and/or grease barrier layer is present in the multilayer curtain the coated substrate has a Kit value of at least about 5 in the flat-test,
    - in case a water vapor barrier layer is present in the multilayer curtain the coated substrate has a water vapor transmission rate of less than about 50 g/(m<sup>2</sup>/day) (50% relative humidity, 23°C),
    - in case a water resistance layer is present in the multilayer curtain the coated substrate has a 10 minute Cobb value of less than about 20 g/m<sup>2</sup>,
    - in case an oxygen barrier layer is present in the multilayer curtain the coated substrate has an oxygen transmission rate of less than about 200 cm<sup>3</sup>/(m<sup>2</sup>/d/bar) (1 atm, 23°C, 90% relative humidity).
2. The method of Claim 1, characterized in that the free flowing curtain of step a) comprises an additional top layer providing printability.
3. The method of Claim 1, characterized in that in case an oil and/or grease barrier layer is present in step a), the coated substrate has a Kit value of at least about 8 in the flat-test, preferably at least about 11 in the flat-test.
4. The method of Claim 1, characterized in that in case a water vapor barrier layer is present in step a), the coated substrate has a water vapor transmission rate of less than about 40 g/(m<sup>2</sup>/day) (50% relative humidity, 23°C), preferably less than about 30 g/(m<sup>2</sup>/day) (50% relative humidity, 23°C).

5. The method of Claim 1, characterized in that in case a water resistance barrier layer is present in step a), the coated substrate has a 10 minute Cobb value of less than about 12 g/m<sup>2</sup>.
- 5 6. The method of Claim 1, characterized in that in case an oxygen barrier layer is present in step a), the coated substrate has an oxygen transmission rate of less than about 150 cm<sup>3</sup>/(m<sup>2</sup>/24h/bar) (1 atm, 23°C, 90% relative humidity).
7. The method of Claim 1, wherein the curtain is formed with a slot die.
- 10 8. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least an additional layer providing fold crack resistance.
9. The method of Claim 1, characterized in that at least one of the layers of the multilayer curtain of step a) has a coatweight when dried of less than about 30 g/m<sup>2</sup>.
- 15 10. The method of Claim 1, characterized in that at least one of the layers of the multilayer curtain of step a) has a coatweight when dried of less than about 20 g/m<sup>2</sup>.
- 20 11. The method of Claim 1, characterized in that at least one of the layers of the multilayer curtain of step a) has a coatweight when dried of less than about 10 g/m<sup>2</sup>.
12. The method of Claim 1, characterized in that the multilayer curtain of step a) has a coatweight when dried of less than about 60 g/m<sup>2</sup>.
- 25 13. The method of Claim 1, characterized in that the multilayer curtain of step a) has a coatweight when dried of less than about 30 g/m<sup>2</sup>.
14. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least 3 layers.
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15. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least 4 layers.
16. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least 5 layers.
17. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least 6 layers.
18. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least one layer comprising at least one pigment.
19. The method of Claim 18, characterized in that the pigment is selected from the group consisting of clay, kaolin, calcined clay, talc, calcium carbonate, laminar nanoparticles, high aspect ratio clays, titanium dioxide, satin white, synthetic polymer pigment, zinc oxide, barium sulfate, gypsum, silica, alumina trihydrate, mica, and diatomaceous earth.
20. The method of Claim 1, characterized in that at least one layer imparting barrier functionality of the multilayer curtain of step a) comprises at least one or more components selected from the group consisting of ethylene acrylic acid copolymers, ethylene vinyl alcohol copolymers, polyurethanes, epoxy resins, polyesters, polyolefins, carboxylated styrene butadiene latexes, carboxylated styrene acrylate latexes, polyvinylidene chlorides, polyvinyl chlorides, starches, proteins, styrene-acrylic copolymers, styrene maleic anhydrides, polyvinyl alcohols, polyvinyl acetates, carboxymethyl celluloses, silicones, waxes, neoprenes, polyhydroxy ethers, lacquers, polylactic acids, copolymers of polylactic acid, polymers containing fluorine atoms, copolymers of acrylonitrile, carboxylated styrene butadiene acrylonitrile copolymers, and mixtures thereof.
21. The method of Claim 1, characterized in that at least one layer imparting barrier functionality of the multilayer curtain of step a) comprises at least one or more components selected from the group consisting of polyvinyl chlorides, neoprenes,

polyhydroxy ethers, lacquers, polylactic acids, copolymers of polylactic acid, polymers containing fluorine atoms, copolymers of acrylonitrile, carboxylated styrene butadiene acrylonitrile copolymers, and mixtures thereof.

- 5    22. The method of Claim 1, characterized in that at least one layer of the multilayer free flowing curtain of step a) comprises at least one surfactant.
23. The method of Claim 1, characterized in that the multilayer free flowing curtain of step a) has a solids content of at least about 10 wt.%.  
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24. The method of Claim 1, characterized in that the multilayer free flowing curtain of step a) has a solids content of at least about 40 wt.%.  
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25. The method of Claim 1, characterized in that the multilayer free flowing curtain of step a) has a solids content of at least about 45 wt.%.  
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26. The method of Claim 1, characterized in that the continuous web substrate of step b) is a basepaper or a paperboard.
27. The method of Claim 1, characterized in that the continuous web substrate of step b) is neither precoated nor precalendered.  
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28. The method of Claim 1, characterized in that the continuous web substrate of step b) has a web velocity of at least about 200 m/min.
29. The method of Claim 1, characterized in that the continuous web substrate of step b) has a web velocity of at least about 400 m/min.
30. The method of Claim 1, characterized in that the continuous web substrate of step b) has a web velocity of at least about 500 m/min.  
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31. The method of Claim 1, characterized in that the continuous web substrate of step b) has a grammage, or basis weight, of from about 30 to 400 g/m<sup>2</sup>.
32. A coated substrate obtainable by the method of claim 1.
- 5 33. A coated substrate according to claim 32, characterized in that the coated substrate is coated paper or paperboard.
- 10 34. The method of Claim 1, characterized in that the multilayer curtain of step a) comprises at least an additional layer providing at least one of the following: sheet stiffness; sheet flexibility; release properties; adhesive properties; friction control; heat seal properties; and abrasion resistance properties.
- 15 35. A method of producing a coated substrate comprising the steps of:  
a) forming a composite, multilayer free flowing curtain, whereby the multilayer free flowing curtain comprises at least two layers imparting at least two different barrier functionalities selected from the group consisting of oil and/or grease barrier functionality, water vapor barrier functionality, water resistance functionality, aroma barrier functionality, organic solvent barrier functionality, and oxygen barrier  
20 functionality, and  
b) contacting the curtain with a continuous web substrate.
36. The method of Claim 1, wherein the curtain is formed with a slot die.
- 25 37. The method of Claim 1, wherein the curtain is formed with a slide die.
38. The method of Claim 1, wherein at least one layer of the curtain comprises polyethylene oxide.
- 30 39. The method of Claim 1, wherein the curtain comprises polyethylene oxide in the interface layer.

40. The method of Claim 18, characterized in that the pigment comprises synthetic magadiite.

41. A method of producing a coated substrate comprising the steps of:

- 5 a) forming a composite, multilayer free flowing curtain, wherein at least one of the layers of the curtain has a coatweight when dried of less than about  $30 \text{ g/m}^2$ , the curtain has a solids content of at least about 40 wt.%, and at least one layer of the curtain comprises polyethylene oxide, whereby the multilayer free flowing curtain comprises at least two layers imparting at least two different barrier functionalities selected from the
- 10 group consisting of oil and/or grease barrier functionality, water vapor barrier functionality, water resistance functionality, and oxygen barrier functionality, and
- b) contacting the curtain with a continuous web substrate having a velocity of at least about 200 m/min., whereby,
- 15 in case an oil and/or grease barrier layer is present in the multilayer curtain the coated substrate has a Kit value of at least about 5 in the flat-test,
- in case a water vapor barrier layer is present in the multilayer curtain the coated substrate has a water vapor transmission rate of less than about  $50 \text{ g/(m}^2\text{/day)}$  (50% relative humidity,  $23^\circ\text{C}$ ),
- in case a water resistance layer is present in the multilayer curtain the coated substrate
- 20 has a 10 minute Cobb value of less than about  $20 \text{ g/m}^2$ ,
- in case an oxygen barrier layer is present in the multilayer curtain the coated substrate has an oxygen transmission rate of less than about  $200 \text{ cm}^3\text{/(m}^2\text{/d/bar)}$  (1 atm,  $23^\circ\text{C}$ , 90% relative humidity).